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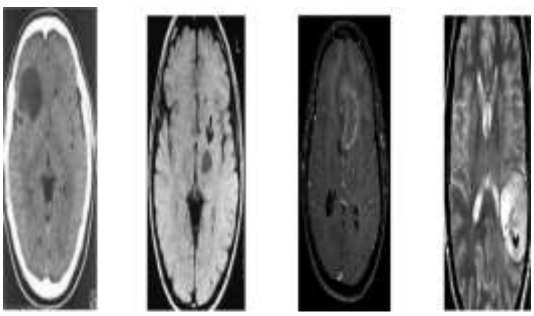
AUTOMATED SEGMENTATION OF BRAIN TUMOUR MRI IMAGES USING DEEP LEANING

#1J.KUMARI, #2 CHANDANA EDURU
#1 Assistant Professeor
#2 MCA Scholar
Department of Master of Computer Applications,
Qis College of Engineering and Technology

ABSTRACT
A brain tumour is understood by the scientific community as the growth of abnormal cells in the brain, some of which can lead to cancer. The traditional method to detect brain tumours is nuclear magnetic resonance (MRI). Having the MRI images, information about the uncontrolled growth of tissue in the brain is identified Brain tumour detection is done through the application of Machine Learning and Deep Learning algorithms. VGG16 are applied in the detection of the presence of brain tumour, and its performance is analyzed through different metrics In proposed on LSTM Algorithm The aggressive nature and diversity of gliomas, well-organized and exact segmentation methods used to classify tumours. Merging the result of two separate segmentation networks the method demonstrates a major but simple combinational strategy. By the whole tumour enhanced tumour, and tumour core will define the validation set. Segmenting brain tumours by using MR data for disease investigation and monitoring. Segmenting brain tumours automatically using MR data is crucial for disease investigation and monitoring. Due to the aggressive nature and diversity of gliomas, well-organized and exact segmentation methods are used to classify tumours intra-tumoural.

INTRODUCTION:
BRAIN TUMOURS

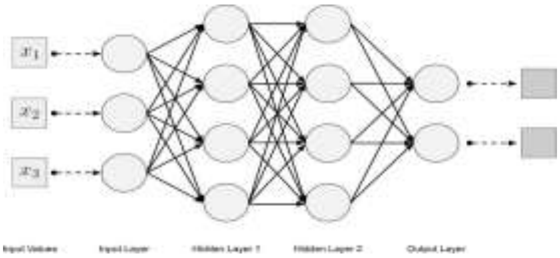
Brain tumours can be classified into two types: benign (noncancerous) and malignant (cancerous). The malignant tumours can quickly spread to other tissues in the brain and lead to worsening the patient’s condition. When most of the cells are old or damaged, they are destroyed and replaced by new cells. if damaged and old



cells are not eliminated with generating the new cells, it can cause problems. The production of additional cells often results in the formation of a mass of tissue, which refers to the growth or tumour. Brain tumour detection is very complicated and difficult due to the size, shape, location and type of tumour in the brain. Diagnosis of brain tumours in the early stages of the tumour’s start is difficult because it cannot accurately measure the size and resolution of the tumour. However, if the tumour is diagnosed and treated early in the tumour formation process, the chance of patient’s treatment is very high. Therefore, the treatment of tumour depends on the timely diagnosis of the tumour.

CONVOLUTIONAL NEURAL NETWORK

The main difference between the main channel of the neural network with the normal neural network is that it is able to automatically and locally extract the feature from each image. These types of networks consist of neurons with weights and biases that can be learned. Due to the results of



CNN on the dataset, in order to improve the proposed method. Machine learning algorithm is used to feature extraction. The algorithm used was the clustering algorithm applied on data set, and then the images are applied to the CNN. The results showed that the proposed method has been successful.

The purpose of extracting the property before applying to the CNN is that in some images fatty masses are considered as tumours, or in some images the tumour is mistakenly considered to be fat and should have increased medical error. Extracting the attribute initially and before applying the CNN leads to improved network accuracy and increased accuracy In , an automated method is used to identify and categorize MRI images.

Literature Survey:

Title: Revalence of Autism Spectrum Disorder Among Children Aged 8 Years

Year: 2014

Author: N.V. Ramana Murty and Prof. M.S. Prasad Babu

Methodology:

The Autism and Developmental Disabilities Monitoring (ADDM) Network is an active surveillance system that provides estimates of the prevalence of autism spectrum disorder (ASD) among children aged 8 years whose parents or guardians reside within 11 ADDM sites in the United States (Arizona, Arkansas, Colorado, Georgia, Maryland, Minnesota, Missouri, New Jersey, North Carolina, Tennessee, and Wisconsin). ADDM surveillance is conducted in two phases. The first phase involves review and abstraction of comprehensive evaluations that were completed by professional service providers in the community. Staff completing record review and abstraction receive extensive training and supervision and are evaluated according to strict reliability standards to certify effective initial training, identify ongoing training needs, and ensure adherence to the prescribed methodology. Record review and abstraction occurs in a variety of data sources ranging from general pediatric health clinics to specialized programs serving children with developmental disabilities. In addition, most of the ADDM.

Advantages

In direct outgrowth of this study was a favourable recommendation for CT-based Brain Tumour screening by several prestigious organizations.

Disadvantages

Administrative costs to be high

Lack of Real-Time Data.

Title : ALE meta-analysis workflows via the BrainMap

Year: 2016

Author: Harleen Kaur and Siri Krishan Wasan

Methodology:

With the ever-increasing number of studies in human functional brain mapping, an abundance of data has been generated that is ready to be synthesized and modeled on a large scale. The BrainMap database archives peak coordinates from published neuroimaging studies, along with the corresponding metadata that summarize the experimental design. BrainMap was designed to facilitate quantitative meta-analysis of neuroimaging results reported in the literature and supports the use of the activation likelihood estimation (ALE) method. In this paper, we present a discussion of the potential analyses that are possible using the BrainMap database and coordinate-based ALE meta- analyses, along with some examples of how these tools can be applied to create a probabilistic atlas and ontological system of describing function–structure correspondences

Advantages

- These systems can offer a great variety of channels and workspaces to facilitate information sharing and communication between healthcare department.
- Large-Scale Data Synthesis and Quantitative Meta-Analysis.

Disadvantages

- Most of the current data mining tools are too complex for use by Healthcare systems.
- The database may be subject to publication bias, as studies with statistically significant or novel findings are more likely to be published. This bias could affect the generalizability of meta analytic results

Title: Development of functional and structural connectivity

Year: 2016

Author: Samy S. Abu Naser, Bashar G. Bastami

Methodology:

Functional and structural maturation of networks comprised of discrete regions is an important aspect of brain development. The default-mode network (DMN) is a prominent network which includes the posterior cingulate cortex (PCC), medial prefrontal cortex (MPFC), medial temporal lobes (MTL), and angular gyrus (AG). Despite increasing interest in DMN function, little is known about its maturation from childhood to adulthood. Here we examine developmental changes in DMN connectivity using a multimodal imaging approach by combining resting-state fMRI, voxel-based morphometry and diffusion tensor imaging-based tractography. We found that the DMN undergoes significant developmental changes in functional and structural connectivity, but these changes are not uniform across all DMN nodes. Convergent structural and functional connectivity analyses suggest that PCC-mPFC connectivity along the cingulum bundle is the most immature link in the DMN of children. Both PCC and mPFC also showed gray matter volume differences, as well as prominent macrostructural and microstructural differences in the dorsal cingulum bundle linking these regions. Notably, structural connectivity between PCC and left MTL was either weak or non-existent in children, even though functional connectivity did not differ from that of adults.

method is used to identify a tumour using a CNN with 3 × 3 small kernels. The method obtained simultaneously the first position for the complete, core, and enhancing regions in dice similarity, coefficient metric (0.88, 0.83, 0.77), at the BRATS Challenge 2013. In Alex net model CNN is used to simultaneously diagnose MS and normal tumours. The CNN was able to accurately classify 98.67% images correctly into three classes.

In , a multi-stage Fuzzy C-Means (FCM) framework was proposed to segment brain tumours from MRI images. In , An efficient and effective method which uses CNNs used for classification and segmentation. The proposed method, used Image Net for extract features. The results obtained 97.5% accuracy for classification and 84% accuracy for segmentation. In [, multiphase MRI images in tumour grading have been studied and a comparison has been made between the results of deep learning structures and base neural networks.

Advantages

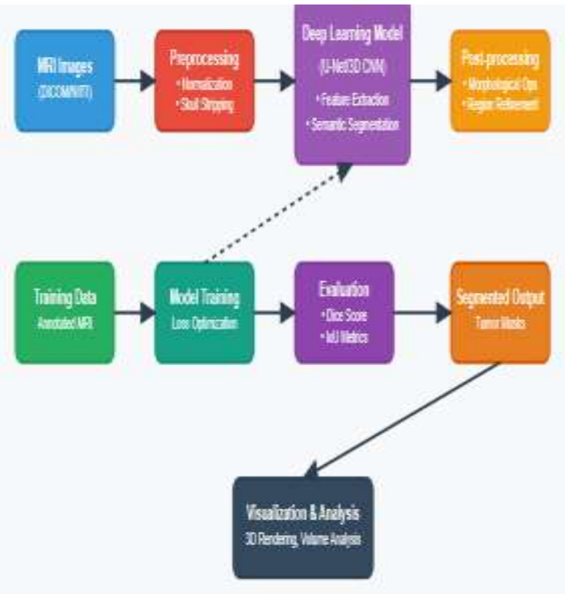
- Still effective in cases where number of dimensions is greater than the number of samples.
- Uses a subset of training points in the decision function so it is also memory efficient.

Disadvantage

- It is time complexity being high, and not suitable for large-scale data.

The results demonstrate the good performance of this method using ERT classifier. In , an automatic classification

SYSTEM ARCHITECTURE:



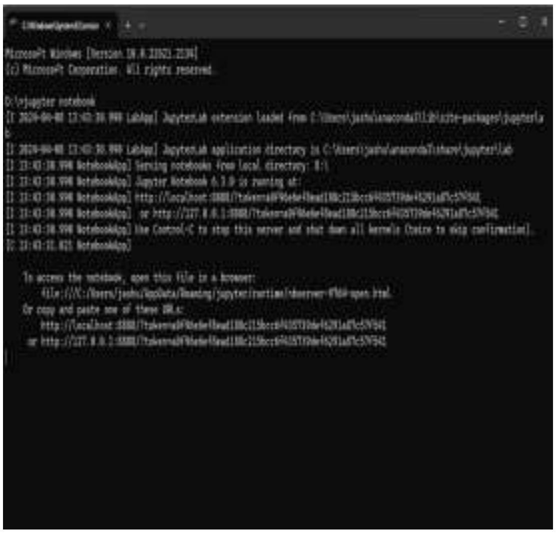
We suggest an MRI image-based BT classification technique that is completely automated. The specified objective is to categorize three different forms of cancers in brain scans, including gliomas and pituitary tumours, using a three- class classification problem. These three BT types are the most prevalent. A DCNN with a U-Net sampling model is used for classification, as well as to extract image features. The open dataset from share is used in the evaluation. Our work is motivated by the following factors, First, greater accuracy in the categorization problem involving meningiomas, gliomas, and endocrine tumours is expected. Medical professionals' treatment regimens would benefit from a precise, computer-aided automatic classification approach for the three different types of tumours. Second, recent classification challenges that employed DL techniques and reliable classifiers were successful in producing highly accurate results. Medical imaging data are hard to attain, which is the third issue. To overcome this practical restriction, advanced design techniques are needed.

BRAIN TUMOUR DETECTION

The following are the contributions made by this work:

- To extract characteristics from brain MRI images containing tumours, a CNN model was created.
- On datasets containing medical images, it was discovered that the CNN layout produced better classification results.
- The feature maps are produced after numerous convolutional layers have extracted features from the input images.
- The BraTS dataset was used to create a model with 98% overall accuracy;
- Regarding computational complexity, a comparison between the proposed approach and a transfer learning-based strategy is given.

IMPLEMENTATION:



CONCLUSION

In DL a LSTM is a class of DL , most commonly applied to analyse visual imagery. Now when we think of a neural network we think about matrix multiplications but that is not the case with ConvNet. It uses a special technique called Convolution. Now in mathematics convolution is a mathematical operation on two functions that produces a third function that expresses how the shape of one is modified by the other.

Multimodal MRI brain tumour image segmentation task, segmenting the entire tumour and tumour core area, enhanced tumour area from normal brain tissue. The research on computer-aided diagnosis and treatment of multimodal MRI brain tumour image segmentation has always been an important topic in the field of medical image processing. The difference in imaging equipment and imaging conditions will cause even the same patient in the same period to have a different MRI with different properties.

FUTURE ENHANCEMENT

In the future, different dataset will be investigated to check the system robustness and more CNN models will be tested to improve the performance and identification of smallest tumours

Incorporate information from multiple imaging modalities (such as T1- weighted, T2 weighted, and FLAIR) to improve segmentation accuracy. Multi- modal fusion can provide a more comprehensive understanding of the tumour characteristics.

Continuous collaboration between researchers, clinicians, and machine learning experts is essential for addressing these challenges and making progress in automated brain tumour segmentation using deep learning

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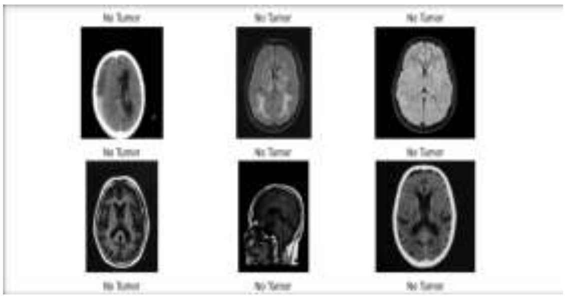

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Authors:

Mrs. J. Kumari is an Assistant Professor in the Department of Master of Computer Applications at QIS College of Engineering and Technology, Ongole, Andhra Pradesh. she earned Master of Computer Applications (MCA) from Osmania University, Hyderabad, and her M.Tech in Computer Science and Engineering (CSE) from Jawaharlal Nehru Technological University, Kakinada (JNTUK). Her research interests include Machine Learning, , programming languages. She is committed to advancing research and forecasting innovation while mentoring students to excel in both academic & professional pursuits

Ms Chandana Eduru has Received has her MCA (DUAL) And Degree From Vikrama simhapuri university Pursuing, Now Currently she is pursuing MCA Qis College Of Affiliated to Engineering and technology JNTUK 2023- 2025